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## NOTES ON TWO OXYBELID WASPS IN SAN FRANCISCO, CALIFORNIA

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OXYBELUS QUADRINOTATUS Say, var. MONTANUS Robertson  
(1889)

(Fig. 1, female)

This little sand wasp is still common and widely distributed in San Francisco, for it can withstand to a considerable degree the encroachments of civilization, accommodating itself to large gardens with sandy soil and sunny exposure and finding sufficient flies with which to provision its nest hole. The writer remembers it in the early nineties, when as a small boy he watched it nesting in the sandy backyard of the house tenanted by the large Williams family.

*Oxybelus* is a very sturdy roughly sculptured wasp some  $\frac{5}{8}$  millimeters long and the black color of which is relieved by pairs of whitish spots on the abdomen. The female digs moderately deep sloping burrows of several cells. She bites loose the sand which she scoops and brushes out with her strong legs so that a little heap of sand accumulates before the tunnel. The cells are stuffed with appropriate flies that have been rendered helpless, probably through stinging. The common housefly is often utilized by the wasp. I have also found an Anthomyid<sup>1</sup> stored in her burrow as well as two species of relatively large flies of the family Therevidæ.<sup>2</sup>

On leaving her burrow *Oxybelus* stoppers up the entrance with sand so that on her return laden with her fly victim, she may be obliged to search a bit to locate the plugged up tunnel which she immediately digs open. However, she never releases her hold on the limp and slightly twitching prey that protrudes well beyond her abdomen.

<sup>1</sup> *Helemyia fusciceps* Leth., probably. Unfortunately there were no males for absolute determination.

<sup>2</sup> *Thereva comata* Loew and *Thereva vanduzeei* Cole., I am indebted to Mr. E. P. Van Duzee of the California Academy of Sciences for these determinations.

The manner in which *Oxybelus* carries her prey has been observed by a number of competent entomologists, both in Europe and in the United States. It may vary with the species, or even at times, in the species. Observations on this phase of the wasp's activities are usually made when the burdened wasp is manouvering about her burrow. Dr. J. B. Parker's careful studies on *Oxybelus quadrinotatus* Say (Proc. Ent. Soc. Wash., XVII, 1915, pp. 74, 75, pl. XI, Fig. 9) show that this insect carries her prey impaled on her sting and that, at least when resting on the ground her six legs are free<sup>3</sup>. Regarding the San Franciscan *Oxybelus* I quote from Mr. C. L. Fox (Pan-Pacific Entomologist III, 1927, No. 4, p. 198): "In the backyard garden of my home in San Francisco I have been observing this quick fly-catching wasp. It was burrowing into the ground whilst, with its third pair of legs, it firmly grasped a stout fly (*Lucilia caesar* L.). The victim was much larger, with its whole body projecting behind the little wasp, presenting a very curious appearance. . . . It is probably a western form of *O. quadrinotatus* Say." The present writer, using a method of observation employed also by other entomologists, i.e. that of clapping a small glass container over a burdened *Oxybelus* that is searching for her stoppered burrow, noticed that *O. quadrinotatus*, var. *montanus* at Lone Mountain, San Francisco, carried her prey headfirst on downbent sting that impaled it on the thorax. Then, all the wasp's legs were plainly seen to be free of the load but, presumably to secure a fresh hold on her prey she would grasp it with one or more pairs of legs, bend the tip of her body against the fly, in this case a therevid, and then impale it with her sting. Dr. Ch. Ferton (Ann. Soc. Ent. France, LXXI, 1902, pp. 516, 517), referring to *Oxybelus 14-notatus* Oliv. is in agreement with Shuckard and Gerstæcker, in stating that this little wasp, perhaps because of her small size, carries her prey clasped against her underside by means of her posterior legs and that she is thus able to easily enter her burrow that is left open on going to the chase. And Ferton found on the other hand that the species of *Oxybelus* that carry their prey by holding it with the sting and the two posterior feet, cover up their nest on going out, but having the two anterior pairs of

<sup>3</sup> Of interest in this connection is an observation by Dr. E. T. Nielson (Ent. Meddelelser, XVIII, 3, 1933, (p. 272), who found that *Crabo* (*Crossocerus*) *elongatulus* v.d. Linden carried her fly prey by means of both her sting and her legs.

legs free, are easily able to dig open the tunnel without losing hold of their prey. In this case the fore part of the prey does not extend anterior to the base of the wasp's abdomen and thus little interferes with digging.

The cocoon of *Oxybelus* is stout and composed of agglutinated sand grains.

In San Francisco *Oxybelus* sometimes falls a victim to *Philanthus californicus* Cresson, a larger fossorial wasp that provisions her nest hole with various small wasps and with small bees.

I am indebted to Dr. V. S. L. Pate of Cornell University for determining these two wasps and for references and other data relating to the Oxybelidæ.

#### BELOMICRUS FRANCISCUS Pate

(Fig. 2, female, 2A, *Trichochrous antennatus*, its prey)

*Belomicrus franciscus* is a tiny and thickset wasp about 5 millimeters long that was described by Dr. V. S. L. Pate (Ent. News, XLIII, pp. 77-78, 1931) from specimens collected by the writer at Lone Mountain, San Francisco, California, in 1930. Since Dr. Pate states (l.c., p. 77) that: "Hitherto nothing has been known concerning the biology of any *Belomicrus* save a few scattered flower records" it may be of interest to present my fragmentary observations on *B. franciscus*, much as they were written down in 1930 and thus before the wasp's particular habitat had been greatly altered by the hand of man.

"Lone Mountain" known in the days of Spanish occupation as "El Divisadero" is a sand-covered hillock about 468 feet above sea level. It supports a variety of low vegetation and is relatively rich in wasp life. The east and southeast slopes appear most favorable for wasps and insects in general. *Belomicrus franciscus* is one of the more than 40 species of aculeate or stinging wasps still to be found in this oasis. It was not infrequently seen in late April and in May, 1930, sunning itself on a tiny path, patronizing the flowers of the little sand mat (*Panatacæna ramosissima* H. & A., Caryophyllacæ), or engaged in nesting activities. Several females were observed in a small area excavating their burrows in the sand. Unlike *Oxybelus*, its larger relative, *Belomicrus* does not use her legs to throw the sand behind and out of her

burrow, although at the beginning of operations she may employ the forelegs a bit to help clear the nesting site. The hind portion of her cheeks, the underside of her mandibles and the fore coxæ and femora are provided with a rather sparse comb of long gently curved bristles that when used together constitute an effective *psammophore* or sand carrier. She first detaches the sand, probably with her jaws, and then, no doubt using her combs of bristles, grabs up a load of sand between mouth and chest and rises obliquely backwards with the load which she releases at the moment of swinging obliquely downwards to her burrow. The insect is so small and active however, that her exact *modus operandi* is difficult to follow. These flights, each of several inches, are repeated again and again so that *Belomicrus* is soon plunging out of sight into her deepening burrow. Note, however, that she always backs out of the burrow and maintains this backwards position, flying tail first obliquely upwards and returning headfirst obliquely downwards. Thus, the extracted sand is not heaped up at the mouth of the tunnel but is scattered from the air. Making a burrow sometimes requires part of at least two days, particularly when there is dull weather intervening. I was not successful in tracing the burrows through the sand; these cannot be deep and they probably have several cells each. When the wasp has finished excavating, at least for the time being, she issues headfirst from her burrow, as do other wasps under like circumstances.

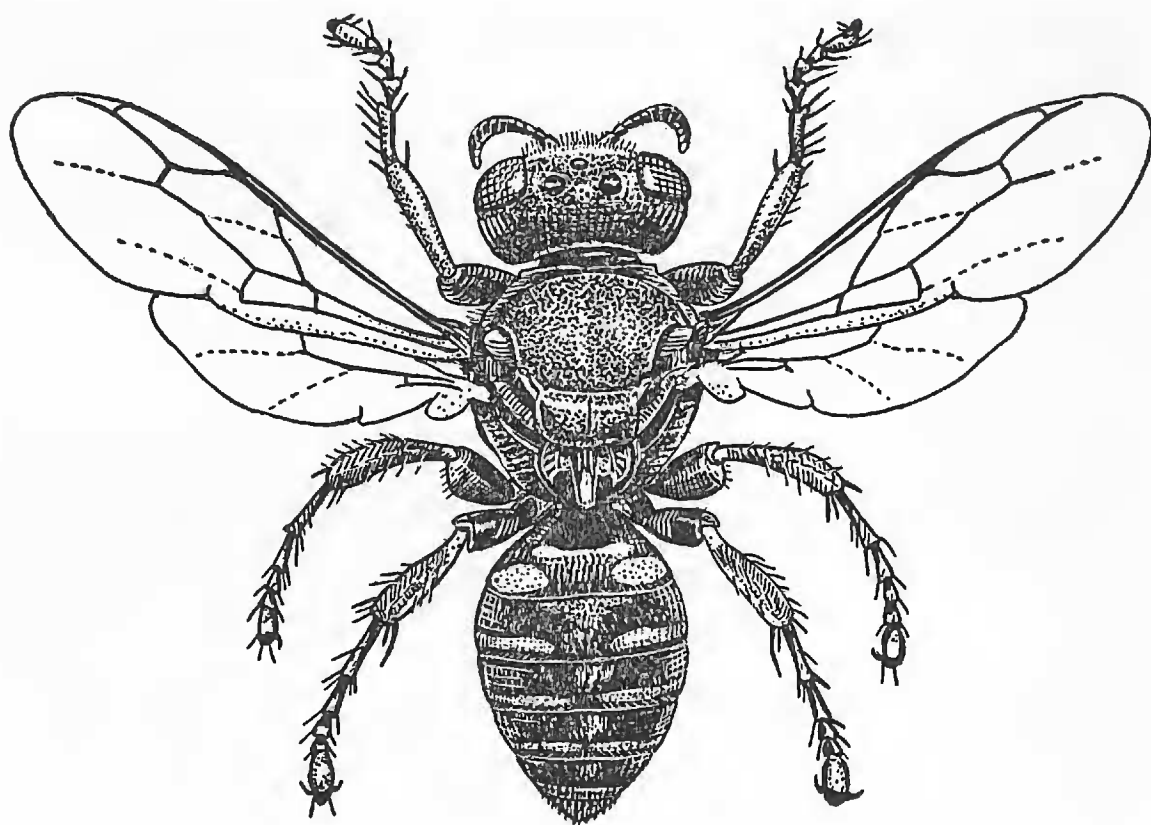
*Belomicrus* stores her burrow with *Trichochrous antennatus* Mots<sup>4</sup> (Melyridæ), a small beetle abundant on certain flowers, as *Eschscholtzia* (poppy) and some compositæ. Perhaps other species of the large genus *Trichochrous* are also used by our wasp. Several prey laden *Belomicrus* were noted as they halted for a rest some distance from their burrows, when, clasping the immobile beetle beneath their body they would lose balance and keel over on the sand. But after a brief rest the wasp flies to her open tunnel, which she enters without a pause.

By stopping up the burrow of a *Belomicrus* immediately after she had gone foraging, I was able to secure the returning wasp with her beetle prey, by placing a glass vial or a jelly tumbler over her while she vainly sought to locate the burrow, but main-

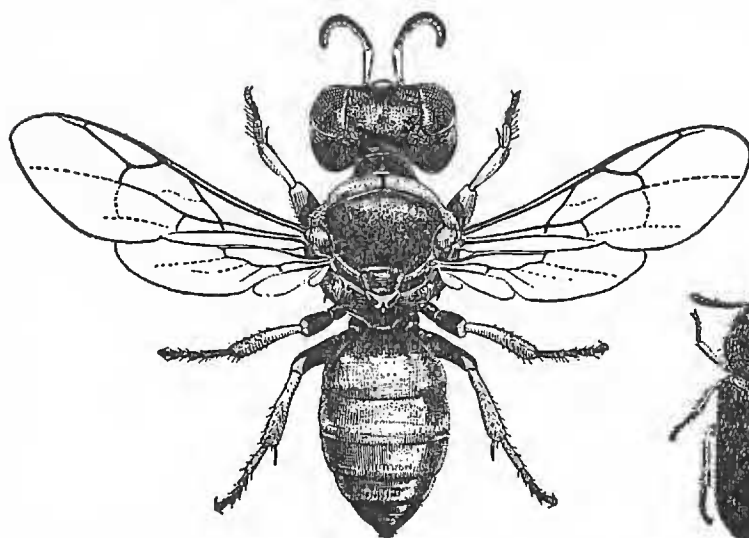
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<sup>4</sup> Identified by Dr. F. E. Blaisdell, Sr.

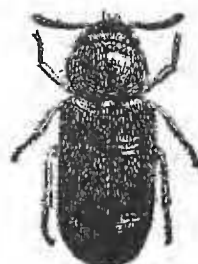




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2



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taining the while her hold on the beetle. Since *Belomicrus* several times exceeds her prey in bulk, it follows that a number of beetles are stored in each cell as food for the wasp grub.

This wasp was not observed filling up her burrow after it has been provisioned. Doubtless, however, the legs would be employed here for scraping.

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## TWO WATER BEETLES THAT LAY THEIR EGGS IN THE FROTHY EGG MASSES OF A FROG OR TREE TOAD<sup>1</sup>

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During the wet season of 1934, at Escuintla, Guatemala, the writer on separate occasions gathered portions of masses of white froth in certain of the more or less shaded rain puddles by the roadside. These foamy masses formed a sort of wet float and protective covering for the large number of eggs imbedded in them, the whole being deposited by a certain amphibian, probably a tree toad.

They were sometimes fastened to objects in the puddles but were more common along the banks at the water line or, with receding waters, some little distance above them. When placed in a jar of water these masses usually yielded tadpoles within a day or two; these tadpoles soon sought the bottom remaining quiet there, although sometimes dashing about. In addition to tadpoles, however, portions of four different froth masses gathered on different dates produced a number of larvæ of a dytiscid beetle. These larvæ were about 5 mm. long, exclusive of appendages, at the start and much resembled those of our Hawaiian *Rhantus pacificus*, being similarly protected by dark chitinous plates, and were likewise graceful swimmers, though in no wise equalling the tadpoles in speed. For the most part they hung jaws agape, at the surface, breathing at the tail end of the body. But they quickly attacked the tadpoles, catching them suddenly

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<sup>1</sup>Two species of Dytiscidæ are here involved. Young larvæ sent to the Bureau of Entomology, United States Department of Agriculture, Washington, D. C., were referred to the subfamily Colymbetinae, *Rhantus* (Calidus F.), while a large larva with a long tubiform terminal segment was referred to Colymbetinae (near *Ilybius*).